

REMARKS

Claims 1-18 were pending. Claims 1, 2, 8, 9, 12, and 13 have been amended. Claim 19 has been added. Claims 1-19 are pending.

Claims 12-18 stand rejected under 35 U.S.C. § 112, second paragraph, based on indefiniteness. Claim 12 has been amended for clarity, and is submitted as particularly pointing out and distinctly claiming the subject matter of the invention. The Office Action expresses concern that the portion of claim 12 deleted herein is not described in the specification. Applicant notes, however, that the specification describes applying voltage with “a commercial frequency remaining intact” on page 5, lines 10-21, for example. The limitation deleted from claim 12 has been included in new claim 19.

Claim 1 stands rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 4,139,790 to Steen. Claims 3-8, 10, and 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Steen. Claims 2 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Steen in view of U.S. Pat. No. 3,688,141 to Maslennikov et al. Reconsideration of these rejections respectfully is requested.

Claim 1 has been amended to include the limitation from claim 2 that the rotor conductor upper portion has a trapezoidal cross sectional shape. Claim 1 also recites, *inter alia*, that the trapezoidal cross sectional shape tapers continuously toward the outer periphery of the rotor. A rotor conductor lower portion contiguous with the rotor conductor upper portion has a rectangular cross sectional shape of the same width as that of the bottom of the rotor conductor upper portion.

The rotor conductors taught in Steen have upper portions with a triangular cross sectional shape. As the Office Action recognizes in paragraph nos. 5 and 7, Steen does not show rotor conductors having a trapezoidal cross sectional shape. Further, Steen discloses a rotor conductor lower portion, shown in Fig. 3, that tapers continuously toward the shaft (19). That is, the lower portion has a trapezoidal, cross sectional shape, not a rectangular cross sectional shape with the same width as that of the bottom of the rotor conductor

upper portion. Applicants note that a special technique is needed for producing the rotor conductors of Steen. By comparison, the rectangular lower portions of the present invention are derived relatively easily from a drawn material. Steen does not teach or suggest the invention recited in amended claim 1.

Advantageously, the resistance of the rotor conductor in the invention recited in amended claim 1 is increased by using the upper portion having a trapezoidal cross sectional shape, as compared to using a triangular cross sectional shape as in Steen. As a result, an improvement in efficiency in a steady state can be achieved. Further, a magnetic flux passing through the inventive rotor conductor increases so that leakage reactance is reduced. In addition, a high power factor is obtained because the width of the rotor conductor upper portion near the outer periphery of the rotor increases. The invention provides a rotating electrical machine having starting characteristics of low current and high torque. The machine also has a good balance between starting characteristics and steady-state characteristics.

Maslennikov et al. does not cure the deficiencies of Steen. Maslennikov et al. discloses a squirrel cage rotor in which the conductor has a trapezoidal cross sectional shape for the purpose of keeping the conductor from getting loose. The conductor of Maslennikov et al. does not comprise a lower portion that is contiguous with the rotor conductor upper portion. Instead, items 8 disclosed in Maslennikov et al. are counter-opposed wedges holding the conductor in place. Maslennikov et al. also does not disclose a conductor having a lower portion with a rectangular cross sectional shape. Further, Maslennikov et al. does not disclose a lower portion with substantially the same width as that of the bottom of the rotor conductor upper portion. Amended claim 1 and its dependent claims 3-7 are patentable over the cited references to Steen and Maslennikov et al., taken alone or in combination.

Claim 8 has been amended to include the limitation from claim 9 that the rotor conductor upper portion has a trapezoidal cross sectional shape. Claims 8-11 are

patentable over the references to Steen and Maslennikov et al. for reasons similar to those discussed above with respect to claims 1-7.

Claims 12, 14-16, and 18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Steen in view of U.S. Pat. No. 4,785,213 to Satake. Claims 13 and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Steen in view of Satake, and further in view of Maslennikov et al. Reconsideration of these rejections respectfully is requested.

Claim 12 has been amended to include the rotor conductor upper portion which has a trapezoidal cross sectional shape. As described above, Steen does not disclose the trapezoidal cross sectional shape.

Satake does not cure the deficiencies of Steen. Satake is cited as providing a power supply for delivering three-phase alternating current to a cage induction motor. Satake does not disclose the rotor conductor upper portion with the trapezoidal cross sectional shape.

Maslennikov et al. does not cure the deficiencies of Steen and Satake. As noted above, Maslennikov et al. shows a conductor with a trapezoidal shape, but does not teach a corresponding rotor conductor lower portion contiguous with the rotor conductor upper portion. Further, Maslennikov et al. does not show that the contiguous lower portion has a rectangular cross sectional shape with the same width as that of the bottom of the rotor conductor upper portion. Claims 12-19 are believed to be patentable over the proposed combinations of Steen, Satake, and Maslennikov et al.

Motivation for the combinations of the cited references proposed in the Office Action is lacking. The Office Action proposes that one of skill in the art would have been motivated to modify the Steen disclosure to provide a trapezoidal shape for the purpose of keeping the conductor from getting loose. Applicants respectfully point out, however, that conductors with upper portions having trapezoidal cross sections are unnecessary and

would serve no purpose in the Steen disclosure. The conductor bars 33 shown in Steen have a triangular shape at the upper portion that would keep the conductor bars from working loose. In addition, the conductor bars 33 shown in Steen are cast in place. By contrast, the bars of Maslennikov et al. are wedged into deep, open-ended slots. There is no suggestion in Steen cited references of the need for keeping the conductor bars from getting loose. Moreover, it is not for this purpose that the rotor conductor of the invention has an upper portion having a trapezoidal, cross sectional shape. Instead, it is for the purpose of obtaining a good balance between starting characteristics and steady-state characteristics.

A good balance between starting characteristics and steady-state characteristics is obtained with the invention, by the combination of the upper portion having a trapezoidal cross sectional shape and the lower portion having a cross sectional shape which is rectangular and has substantially the same width as that of a bottom of the rotor conductor upper portion. Maslennikov et al. and Steen are silent on the purpose of the invention. Further, Maslennikov et al. is silent on the above effects obtained by the inventive conductor having a cross sectional shape. Thus, it is not obvious to substitute the conductor of Maslennikov et al. for that of Steen.

Dependent claims 3-7, 10, 11, 14 to 15, and 18 contain further limitations related to the descriptions and sizes of rotor conductors, whereby starting current is lowered, and a good balance between a starting torque and a steady-state efficiency is obtained. The further limitations of these claims provide additional reasons why the recited invention is patentable over the cited prior art.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

By 

Mark J. Thronson

Registration No.: 33,082

Peter McGee

Registration No.: 35,947

DICKSTEIN SHAPIRO MORIN &

OSHINSKY LLP

2101 L Street NW

Washington, DC 20037-1526

(202) 785-9700

Attorneys for Applicant